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EXAMINER

CHEW, BRIAN

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/576,961	Applicant(s) LIU ET AL.	
	Examiner BRIAN CHEW	Art Unit 2195	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 April 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 April 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>4/20/2006, 4/09/2008</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1-24 are presented for examination.

Information Disclosure Statement

2. The information disclosure statement filed April 9, 2008 fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 because the indicated document numbers are incomplete. It has been placed in the application file, but the information referred to therein has not been considered as to the merits. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609.05(a).

Claim Objections

3. Claims 2, 10 and 19 are objected to because of the following informalities:
 - i. Claim 2 recites "wherein the first virtual input/output device comprise at least one of virtual keyboard, virtual mouse, virtual audio device, virtual video device". There are several grammatical errors and shall be amended to read --wherein the first virtual input/output device comprises

at least one of a virtual keyboard, virtual mouse, virtual audio device and virtual video device--. Appropriate correction is required.

- ii. Claim 10 recites "wherein the first input/output device comprise at least one of a virtual keyboard, virtual mouse, virtual audio device and virtual video device". There is a grammatical error and shall be amended to read --wherein the first virtual input/output device comprises at least one of a virtual keyboard, virtual mouse, virtual audio device and virtual video device--. Appropriate correction is required.
- iii. Claim 19 recites "wherein the second virtual hardware device comprise at least one of virtual input/output device, virtual interrupt controller, and virtual event timer". There is a grammatical error and shall be amended to read --wherein the second virtual hardware device comprises at least one of a virtual input/output device, virtual mouse, virtual interrupt controller and virtual event timer--. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

- 4. Claims 1-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which

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applicant regards as the invention. The language in the following claims is not clearly understood:

- i. As per claim 1: Line 2: It is uncertain what is meant by “determining that a device related operation happens in a virtual machine” (i.e. Does this mean that the operation already happened? Operations are supposed to happen in the virtual machine in the future? The virtual machine is attempting to perform an operation?); For the purposes of examination, it will be construed that “determining that a device related operation happens” means determining that the virtual machine is attempting to perform an operation. Lines 3-4: It is uncertain what is meant by “an operation transition from the virtual machine to the kernel component” (i.e. Virtual machine is operating and then switches to kernel component operating? Message between virtual machine to kernel component?); For the purposes of examination, “an operation transition from the virtual machine to the kernel component” will be construed as the virtual machine operating and then switching to the kernel component operating. Line 5: It is uncertain when “determining whether the device related operation can be handled” occurs (i.e. Does this occur only in response to “determining that the operation happens”?); For the purposes of examination, it will be construed that “determining whether the device related operation can be handled” occurs in response to “determining that a device related operation happens”.

- ii. As per claim 3: It is uncertain what is meant by “hybrid virtual machine monitor” (i.e. How is it defined? What is the distinction between a hybrid VMM and a conventional VMM? Does it mean the virtual machine runs directly on the hardware?); For the purposes of examination, “hybrid virtual machine monitor” will be construed as running directly on the hardware.
- iii. As per claim 5: : It is uncertain what is meant by “host virtual machine monitor” (i.e. How is it defined? What is the distinction between a host VMM and a conventional VMM? Is it different from a hybrid virtual machine monitor? Does it mean that the virtual machine monitor hosts virtual machines?); For the purposes of examination, “host virtual machine monitor” will be construed to mean that the virtual machine monitor hosts virtual machines.
- iv. As per claim 6: it is uncertain what is meant by “in-kernel virtual machine monitor” (i.e. Is this in the specification? How is this defined? Is this intended to reference “kernel virtual machine monitor” or “in-kernel device model”? Does it just mean that the virtual machine monitor “may perceive an unauthorized I/O operation related to an I/O device happened in a guest operating system of a virtual machine”?); For the purposes of examination, “In-kernel virtual machine monitor” will be construed to mean that the virtual

machine monitor may perceive an unauthorized I/O operation related to an I/O device happened in a guest operating system of a virtual machine.

- v. As per claim 8: Lines 4-5: It is uncertain what is meant by “an operation transition from the kernel component to the virtual machine” (i.e. Kernel component is operating and then switches to virtual machine operating? Message between kernel component to virtual machine?); For the purposes of examination, “an operation transition from the kernel component to the virtual machine” will be construed as the kernel component operating and then switching to the virtual machine operating.
- vi. As per claim 9: Lines 1-2: It is uncertain when “determine that a device related operation happens in a virtual machine” (i.e. Does this mean that the operation already happened? Operations are supposed to happen in the virtual machine in the future? The virtual machine is attempting to perform a device related operation?); For the purposes of examination, it will be construed that to “determine that a device related operation happens” means determining that the virtual machine is attempting to perform a device related operation. Lines 2-3: It is uncertain what is meant by “an operation transition from the virtual machine to the kernel component” (i.e. Virtual machine is operating and then switches to kernel component operating? Message between virtual machine to kernel component?); For the purposes of

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examination, “an operation transition from the virtual machine to the kernel component” will be construed as the virtual machine operating and then switching to the kernel component operating.

- vii. As per claims 11 and 20, they have the same deficiencies as claim 3.
Appropriate correction is required.
- viii. As per claims 13 and 22, they have the same deficiencies as claim 5.
Appropriate correction is required.
- ix. As per claims 14 and 23, they have the same deficiencies as claim 6.
Appropriate correction is required.
- x. As per claims 16 and 24, they have the same deficiencies as claim 8.
Appropriate correction is required.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

- 5. Claims 9-24 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

6. Claims 9-16 recite a “virtual machine monitor”; however, it appears that the virtual machine monitor would reasonably be interpreted by one of ordinary skill in the art as software, per se, failing to be tangibly embodied or include any recited hardware as part of the system. Software alone is directed to a non-statutory subject matter. Applicant is advised to amend the claims to include hardware (i.e. processor and memory) to overcome the 101 rejection.

7. Claims 17-24 are directed towards a machine-readable medium that is not limited to tangible embodiments, instead being defined in the specification, paragraph 11, to include both tangible embodiments (i.e. magnetic disk media, flash memory) and intangible embodiments (i.e. propagated signals, carrier waves). Applicant is suggested to amend “machine-readable medium” to read “computer storage”. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-3 and 5-11 and 13-20, and 22-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Sugerman et al. ("Virtualizing I/O Devices on VMware Workstation's Hosted Virtual Machine Monitor"; hereinafter Sugerman).

9. As per claim 1, Sugerman teaches a method comprising:

- determining that a device related operation happens in a virtual machine by a kernel component of a virtual machine monitor through an operation transition from the virtual machine to the kernel component (*"In order to virtualize an I/O device, the VMM must be able to intercept all I/O operations issued by the guest operating system... privileged IA-32 IN and OUT instructions. These are trapped by the VMM and emulated... in the VMM"*, Sugerman, section 2.1, paragraph 2, lines 1-6); and
- determining whether the device related operation can be handled by a first virtual input/output device installed inside of the kernel component of the virtual machine monitor (*"The VMM exports a number of virtual I/O ports and a virtual IRQ"*, Sugerman, section 2.2, paragraph 4, lines 2-3; *"Any accesses that interact with the physical I/O hardware must be handled in the VMApp, but the VMM can potentially handle accesses that do not interact with the hardware, e.g., status ports or ports that merely latch data that will be used later"*, Sugerman, section 2.1, paragraph 2, lines 7-12).

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10. As per claim 2, Sugerman teaches the method of claim 1, wherein the first virtual input/output device comprises at least one of a virtual keyboard, virtual mouse, virtual audio device and virtual video device (*"virtual devices. Supported are standard PC devices such as a PS/2 keyboard, PS/2 mouse... Soundblaster 16 sound card... SVGA video controller"*, Sugerman, section 2.1, paragraph 1, lines 2-9; *"The keyboard, for example, is perfectly suited to hosted virtualization"*).

11. As per claim 3, Sugerman teaches the method of claim 1, wherein the virtual machine monitor is a hybrid virtual machine monitor (*"privileged virtual machine monitor component that runs directly on the hardware"*, Sugerman, section 2, paragraph 2, lines 5-6).

12. As per claim 5, Sugerman teaches the method of claim 1, wherein the virtual machine monitor is a host virtual machine monitor (*"virtual machine monitor takes complete control of the machine hardware and creates virtual machines"*, Sugerman, section 1, paragraph 2, lines 2-4; Sugerman, figure 2, VM monitor hosts virtual machine(s) in the VMM world).

13. As per claim 6, Sugerman teaches the method of claim 1, wherein the kernel component is an in-kernel virtual machine monitor of a host operating system (*"Even though the VMM has full system and hardware privileges, it behaves cooperatively and allows the host OS to schedule it"*, Sugerman, section 2, paragraph 6, lines 2-5; *"In*

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order to virtualize an I/O device, the VMM must be able to intercept all I/O operations issued by the guest operating system... privileged IA-32 IN and OUT instructions.

These are trapped by the VMM and emulated... in the VMM”, Sugerman, section 2.1, paragraph 2, lines 1-6).

14. As per claim 7, Sugerman teaches the method of claim 1, further comprising: passing the device related operation to a second virtual input/output device installed outside of the kernel component of the virtual machine monitor (*Sugerman, figure 4, Network Packet Send, VMM context switches to host world and operation is handled by VMNet Driver virtual bridge*), in response to determining that the device related operation can not be handled by the first virtual input/output device (*“Any accesses that interact with the physical I/O hardware must be handled in the VMApp, but the VMM can potentially handle accesses that do not interact with the hardware, e.g., status ports or ports that merely latch data that will be used later”, Sugerman, section 2.1, paragraph 2, lines 7-12).*

15. As per claim 8, Sugerman teaches the method of claim 1, further comprising:

- initiating an interrupt by the first virtual input/output device (*“The VMM posts the virtual IRQ”, Sugerman, section 2.3, paragraph 2, lines 5-6*); and
- injecting the interrupt from the first virtual input/output device to the virtual machine through another operation transition from the kernel component to the virtual machine (*“The monitor safely emulates the operation before returning control to the*

virtual machine”, Sugerman, section 1, paragraph 3, lines 7-8; “The VMM posts the virtual IRQ and the guest’s Lance driver issues a sequence of I/O accesses to acknowledge the receipt to the hardware”, Sugerman, section 2.3, paragraph 2, lines 5-8).

16. As per claim 9, Sugerman teaches a virtual machine monitor (*Sugerman, figure 2, VM Monitor*), comprising a kernel component to determine that a device related operation happens in a virtual machine through an operation transition from the virtual machine to the kernel component (*“In order to virtualize an I/O device, the VMM must be able to intercept all I/O operations issued by the guest operating system... privileged IA-32 IN and OUT instructions. These are trapped by the VMM and emulated... in the VMM”, Sugerman, section 2.1, paragraph 2, lines 1-6*), wherein the kernel component further comprises a first virtual input/output device (*“The VMM exports a number of virtual I/O ports and a virtual IRQ”, Sugerman, section 2.2, paragraph 4, lines 2-3*).

17. As per claim 10, Sugerman teaches the virtual machine monitor of claim 9, wherein the first virtual input/output device comprises at least one of a virtual keyboard, virtual mouse, virtual audio device and virtual video device (*“virtual devices. Supported are standard PC devices such as a PS/2 keyboard, PS/2 mouse... Soundblaster 16 sound card... SVGA video controller”, Sugerman, section 2.1, paragraph 1, lines 2-9; “The keyboard, for example, is perfectly suited to hosted virtualization”*).

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18. As per claim 11, Sugerman teaches the virtual machine monitor of claim 9, wherein the virtual machine monitor is a hybrid virtual machine monitor (*"privileged virtual machine monitor component that runs directly on the hardware"*, Sugerman, section 2, paragraph 2, lines 5-6).

19. As per claim 13, Sugerman teaches the virtual machine monitor of claim 9, wherein the virtual machine monitor is a host virtual machine monitor (*"virtual machine monitor takes complete control of the machine hardware and creates virtual machines"*, Sugerman, section 1, paragraph 2, lines 2-4; Sugerman, figure 2, VM monitor hosts virtual machine(s) in the VMM world).

20. As per claim 14, Sugerman teaches the virtual machine monitor of claim 9, wherein the kernel component is an in-kernel virtual machine monitor of a host operating system (*"Even though the VMM has full system and hardware privileges, it behaves cooperatively and allows the host OS to schedule it"*, Sugerman, section 2, paragraph 6, lines 2-5; *"In order to virtualize an I/O device, the VMM must be able to intercept all I/O operations issued by the guest operating system... privileged IA-32 IN and OUT instructions. These are trapped by the VMM and emulated... in the VMM"*, Sugerman, section 2.1, paragraph 2, lines 1-6).

21. As per claim 15, Sugerman teaches the virtual machine monitor of claim 9, further comprising: a second virtual input/output device installed outside of the kernel

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component of the virtual machine monitor to handle the device related operation (*Sugerman, figure 3, virtual bridge; Sugerman, figure 4, Network Packet Send, VMM context switches to host world and operation is handled by VMNet Driver virtual bridge*) in response to determining that the device related operation can not be handled by the first virtual input/output device (*"Any accesses that interact with the physical I/O hardware must be handled in the VMApp, but the VMM can potentially handle accesses that do not interact with the hardware, e.g., status ports or ports that merely latch data that will be used later", Sugerman, section 2.1, paragraph 2, lines 7-12*).

22. As per claim 16, Sugerman teaches the virtual machine monitor of claim 9, wherein the first virtual input/output device is further to initiate an interrupt and inject the interrupt from the first virtual input/output device to the virtual machine through another operation transition from the kernel component to the virtual machine (*"The monitor safely emulates the operation before returning control to the virtual machine", Sugerman, section 1, paragraph 3, lines 7-8; "The VMM posts the virtual IRQ and the guest's Lance driver issues a sequence of I/O accesses to acknowledge the receipt to the hardware", Sugerman, section 2.3, paragraph 2, lines 5-8*).

23. As per claim 17, Sugerman teaches a machine-readable medium comprising a plurality of instructions (*Sugerman, figure 2, all software components are embodied on physical machine; "VMware Workstation installs like a normal application on an operating system... When run, the application portion uses a driver loaded into the host*

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operating system to establish the privileged virtual machine monitor component that runs directly on the hardware”, Sugerman, section 2, paragraph 2, lines 1-6) which when executed result in an apparatus:

- determining that a device related operation happens in a virtual machine by a kernel component of a virtual machine monitor through an operation transition from the virtual machine to the kernel component (*“In order to virtualize an I/O device, the VMM must be able to intercept all I/O operations issued by the guest operating system... privileged IA-32 IN and OUT instructions. These are trapped by the VMM and emulated... in the VMM”, Sugerman, section 2.1, paragraph 2, lines 1-6)*; and
- determining whether the device related operation can be handled by a first virtual hardware device installed inside of the kernel component of the virtual machine monitor (*“The VMM exports a number of virtual I/O ports and a virtual IRQ”, Sugerman, section 2.2, paragraph 4, lines 2-3; “Any accesses that interact with the physical I/O hardware must be handled in the VMApp, but the VMM can potentially handle accesses that do not interact with the hardware, e.g., status ports or ports that merely latch data that will be used later”, Sugerman, section 2.1, paragraph 2, lines 7-12)*; and
- passing the device related operation to a second virtual hardware device installed outside of the kernel component of the virtual machine monitor (*Sugerman, figure 4, Network Packet Send, VMM context switches to host world and operation is handled by VMNet Driver virtual bridge*), in response to determining that the device related operation can not be handled by the first virtual hardware device (*“Any accesses that*

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interact with the physical I/O hardware must be handled in the VMAApp, but the VMM can potentially handle accesses that do not interact with the hardware, e.g., status ports or ports that merely latch data that will be used later”, Sugerman, section 2.1, paragraph 2, lines 7-12).

24. As per claim 18, Sugerman teaches the machine-readable medium of claim 17, wherein the first virtual hardware device comprises at least one of a virtual input/output device, virtual interrupt controller and virtual event timer (*“the VMM’s interrupt handler”, Sugerman, section 3.2, paragraph 8, line 8).*

25. As per claim 19, Sugerman teaches the machine-readable medium of claim 17, wherein the second virtual hardware device comprises at least one of a virtual input/output device, virtual interrupt controller and virtual event timer (*Sugerman, figure 3, virtual bridge).*

26. As per claim 20, Sugerman teaches the machine-readable medium of claim 17, wherein the virtual machine monitor is a hybrid virtual machine monitor (*“privileged virtual machine monitor component that runs directly on the hardware”, Sugerman, section 2, paragraph 2, lines 5-6).*

27. As per claim 22, Sugerman teaches the machine-readable medium of claim 17, wherein the virtual machine monitor is a host virtual machine monitor (*“virtual machine*

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monitor takes complete control of the machine hardware and creates virtual machines”, Sugerman, section 1, paragraph 2, lines 2-4; Sugerman, figure 2, VM monitor hosts virtual machine(s) in the VMM world).

28. As per claim 23, Sugerman teaches the machine-readable medium of claim 17, wherein the kernel component is an in-kernel virtual machine monitor of a host operating system (*“Even though the VMM has full system and hardware privileges, it behaves cooperatively and allows the host OS to schedule it”, Sugerman, section 2, paragraph 6, lines 2-5; “In order to virtualize an I/O device, the VMM must be able to intercept all I/O operations issued by the guest operating system... privileged IA-32 IN and OUT instructions. These are trapped by the VMM and emulated... in the VMM”, Sugerman, section 2.1, paragraph 2, lines 1-6).*

29. As per claim 24, Sugerman teaches the machine-readable medium of claim 17, wherein the plurality of instructions further result in the apparatus:

- initiating an interrupt by the first virtual hardware device (*“The VMM posts the virtual IRQ”, Sugerman, section 2.3, paragraph 2, lines 5-6); and*
- injecting the interrupt from the first virtual hardware device to the virtual machine through another operation transition from the kernel component to the virtual machine (*“The monitor safely emulates the operation before returning control to the virtual machine”, Sugerman, section 1, paragraph 3, lines 7-8; “The VMM posts the virtual IRQ and the guest’s Lance driver issues a sequence of I/O accesses to*

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acknowledge the receipt to the hardware”, Sugerman, section 2.3, paragraph 2, lines 5-8).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

30. Claims 4, 12 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugerman in view of Barham *et al.* (“Xen and the Art of Virtualization”; hereinafter Barham).

31. As per claim 4, Sugerman teaches the method of claim 3 discussed above, but does not teach wherein the kernel component is a hypervisor of the hybrid virtual machine monitor.

Barham teaches wherein the kernel component is a hypervisor of the hybrid virtual machine monitor (*“We call Xen itself the hypervisor since it operates at a higher privilege level than the supervisor code of the guest operating systems it hosts”, Barham, section 2, paragraph 15, lines 7-9; “the hypervisor must be involved in... scheduling the CPU between domains”, Barham, section 2.3, paragraph 1, lines 3-4).*

One of ordinary skill in the art at the time the invention was made would have been motivated to modify Sugerman with the teachings of Barham to allow “multiple commodity operating systems to share conventional hardware in a safe and resource managed fashion, but without sacrificing either performance or functionality” (*Sugerman, abstract, paragraph 2, lines 2-4*).

32. As per claim 12, Sugerman teaches the virtual machine monitor of claim 9 discussed above, but does not teach wherein the kernel component is a hypervisor of the hybrid virtual machine monitor.

Barham teaches wherein the kernel component is a hypervisor of the hybrid virtual machine monitor (*“We call Xen itself the hypervisor since it operates at a higher privilege level than the supervisor code of the guest operating systems it hosts”, Barham, section 2, paragraph 15, lines 7-9; “the hypervisor must be involved in... scheduling the CPU between domains”, Barham, section 2.3, paragraph 1, lines 3-4*).

33. As per claim 21, Sugerman teaches the machine-readable medium of claim 17 discussed above, but does not teach wherein the kernel component is a hypervisor of the hybrid virtual machine monitor.

Barham teaches wherein the kernel component is a hypervisor of the hybrid virtual machine monitor (*“We call Xen itself the hypervisor since it operates at a higher privilege level than the supervisor code of the guest operating systems it hosts”,*

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Barham, section 2, paragraph 15, lines 7-9; "the hypervisor must be involved in... scheduling the CPU between domains", Barham, section 2.3, paragraph 1, lines 3-4).

Conclusion

34. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Weissman (US 7,590,982) teaches virtualizing processor and interrupt priorities. Onodera (US 5,506,975) teaches virtual machine I/O interrupt control. Schneider *et al.* (US 5,488,716) teaches trapping and handling all kernel-mode instructions by a virtual machine monitor. Ben-Yehuda *et al.* (US 2007/0038996) teaches remote I/O for virtualized systems. Campbell *et al.* (US 2005/0223220) teaches secure virtual machine monitor to tear down a secure execution environment. Goud *et al.* (US 2005/0081212) teaches switching between a service virtual machine and a guest virtual machine in a virtual machine monitor environment. Jeyasingh *et al.* (US 2005/0080970) teaches chipset support for managing hardware interrupts in a virtual machine system. Bennett *et al.* (US 2005/0060703) teaches vectoring an interrupt or exception upon resuming operation of a virtual machine. Bennett *et al.* (US 2005/0060702) teaches optimizing processor-managed resources based on the behavior of a virtual machine monitor. Bennett *et al.* (US 2004/0123288) teaches controlling transitions between a virtual machine and a virtual machine monitor. Bennett *et al.* (US 2004/0117532) teaches controlling external interrupts in a virtual machine system.

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35. Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRIAN CHEW whose telephone number is (571)270-5571. The examiner can normally be reached on Monday-Thursday, 8:00AM-5:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai An can be reached on (571)272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Meng-Ai An/
Supervisory Patent Examiner, Art Unit 2195

/B. C./
Examiner, Art Unit 2195